

RECORD OF DECISION
based on the
FINAL ENVIRONMENTAL IMPACT STATEMENT
for the
SOUTH SPRUCE ECOSYSTEM REHABILITATION PROJECT

Cedar City Ranger District
USDA Forest Service
Dixie National Forest
Iron and Kane Counties, Utah

I. INTRODUCTION

The Forest Service proposes to implement activities to recover wood products, regenerate aspen, and rehabilitate areas affected by spruce beetle in the spruce-fir forests on the Northern Markagunt Plateau located within the Cedar City Ranger District, Dixie National Forest, Iron and Kane Counties, Utah (figure 1). The project area is located approximately 20 air miles east of Cedar City, Utah. Implementation of recovery and rehabilitation activities would be scheduled to commence during the summer of 1999.

This Record of Decision (ROD) was preceded by the December 18, 1998 ROD which was appealed by two separate parties. As a result of the Regional Forester's review of the appeals, the December 18, 1998 ROD was remanded back to the Forest because of a lack of clarity between the Final Environmental Impact Statement (FEIS) and the ROD. One point of confusion was the failure to repeat in the ROD that the sites proposed for salvage/improvement treatments in the FEIS would not be treated until they became infested with epidemic levels of spruce beetle. Another point was the lack of consistency with the terminology and maps associated with the liberation/regeneration treatments. This ROD clarifies these issues. The timber harvest acreage and miles of road closures associated with the selected alternative are identical to those contained in the December 18, 1998 ROD. The acres of aspen regeneration accomplished through burning and miles of road construction have been reduced however, and is explained below. Table A displays the proposed activities by alternative.

II. THE DECISION

A. Selected Alternative for Rehabilitation Activities

As the acting Forest Supervisor, I am the Responsible Official with the delegated authority for this decision. As a result of the analysis contained in the South Spruce Ecosystem Rehabilitation Project Final Environmental Impact Statement (South SERP FEIS) and internal discussions, I have decided to implement Alternative A as described in the FEIS with modifications described below. This Record of Decision is only for those actions which will occur within roaded portions of the project area. I will consider making additional decisions in the future for the roadless portion of the Andesite, Red Desert and Long Valley Focus Areas, as these areas have issues associated with Forest Service Interim Road Rule, 36 CFR Part 212 (interim rule) of

March 1, 1999. The 18 month long interim rule is currently being reviewed to clarify effects to land management activities in roadless areas.

The specific management actions which will be implemented are fully described in the FEIS in Chapter Two, pages 4-18. However, based on a review of the issues identified and responses received during public involvement phases of the analysis, I have decided to make the following changes to Alternative A:

- Add sites 1230056 (48 acres), 1260002 (14 acres), 1260007 (71 acres), and 1260011 (21 acres) for salvage/improvement treatments as shown in appendix 6 of the FEIS. None of these sites are within any inventoried roadless area but are located within areas designated as category two of the interim rule. Site 1230056 is located in the Long Valley Focus Area with the remaining sites located in the Radar Ridge Focus Area. The effects of treating these sites are disclosed in Chapter Four under Alternative B. These areas would be harvested only when they become infested at epidemic levels as described on page three below.
- Drop sites 1250003 (38 acres), 1250014 (12 acres), 1250081 (21 acres) and 1250091 (13 acres) as shown in appendix 6 to maintain wildlife habitat.
- Reduce the miles of road closed from approximately 42.4 to 40.9. The roads that will remain open compared to the other action alternatives are located in the Long Valley Focus Area and will result in an open road density of 1.84 miles per square mile compared with 1.82 with the other action alternatives. This change in road closures reflects the comments received during the comment period.
- To be consistent with the March 1, 1999 interim road rule, drop the 2.3 miles of temporary road construction proposed under Alternative A.
- To be consistent with the 1999 appropriations act, drop the 377 acres of aspen regeneration with fire only (sites 1140042, 44, 46, and 49, 1230016, 18, 20, 31, and 33). The appropriations act specifies that prescribed burns on lands classified in Forest Plans as timber base will not consume commercial wood products that could be removed in a commercially viable manner without public comment. I have determined that the 377 acres approved for aspen regeneration with prescribed fire under the December 1998 ROD contain wood products that could be removed in a commercially viable manner.

With these changes, the modified Alternative A will

1. Salvage harvest dead, dying, and susceptible green Engelmann spruce, and selected green subalpine fir using improvement treatments (2,602 acres); harvest green spruce and subalpine fir over existing aspen clones to liberate or stimulate aspen regeneration (289 acres). These activities will be conducted with ground-based or aerial yarding systems. Exclusive of the aspen liberation/regeneration treatment (289 acres), these activities will not occur unless the areas become infested with epidemic or outbreak levels of spruce beetle. Presently, an estimated 153 acres are infested at epidemic levels.

For the purpose of this decision, the following will be used to define what constitutes a susceptible green spruce, when a tree is considered infested, and when an epidemic level is reached:

- Susceptible green Engelmann spruce are those trees greater than eight inches in diameter at breast height (4.5 ft. from ground level) located in a site with epidemic levels of spruce beetle populations.
- A tree is considered infested when it exhibits reddish-brown boring dust accumulating at the beetle's entrance holes, in bark crevices, and on the ground around the trunk of infested trees. Masses of pitch may accumulate around the entrance sites. Needle discoloration is also an indication of a previously infested host. Needles will turn a yellow-green color before dropping to the forest floor.
- The infestation is considered at epidemic levels when, over a 10 acre site, there are 2-3 infested tree clusters per acre. Each cluster will have 5-7 infested trees (pers. comm. Munson and Benson, 1999). When this condition occurs in each site identified for treatment on figure 5, harvest activities will be implemented.

2. Regenerate approximately 86 acres of mature to old aspen stands with fuelwood or sawtimber harvesting followed by prescribed burning (see figure 5), and

3. Reduce open road densities with temporary and permanent closures of existing, open roads. Road closures are proposed on 40.9 miles of roads and would reduce the open road density to the Forest Plan guideline of two miles per square mile or less (see appendix 9, FEIS). Measures will also be implemented to improve previous road closures that are currently ineffective.

No specified road construction or timber harvesting (including aspen) will occur within the roadless areas shown in appendix 7 of the FEIS. Approximately 51.0 miles of existing roads will require prehaul reconstruction/maintenance, and 0.1 miles of specified road will be constructed. Reforestation activities will occur on approximately 1,600 acres.

Follow-up treatments, including fuels reduction and tree planting, would continue for 1-5 years following the initial treatment in the timber harvest areas. Fuels reduction work is scheduled to reduce wildfire risk, minimize impacts in visually sensitive areas, and prepare the sites for natural or artificial reforestation. Reforestation activities are scheduled for approximately 1,600 acres in areas not expected to meet full tree stocking levels.

Application of the insecticide carbaryl to approximately 1,000 trees in a 10 acre area along Highway 148 is also included in the selected alternative. This bark beetle control measure is widely used to protect trees from bark beetle infestation and will be implemented to maintain scenic value objectives along the highway into Cedar Breaks National Monument.

A site specific amendment to the Dixie National Forest Land and Resource Management Plan (Forest Plan) is also approved under the selected alternative for the purpose of adopting the Scenery Management System and adjusting the boundaries of Management Areas 1A, 2A, and 2B within the South SERP area.

I will consider issuing at least one more decision on rehabilitation activities in the roadless portion of the project area pending agency clarification of the interim road rule. Delaying a decision for management with the roadless area at this time will ensure that any future decision is consistent with agency policy regarding road activities

Table A: Treatment Acreage and Road Closure Miles by Alternative.

ALTERNATIVE	ACRES SALVAGE/ IMPROVE- MENT TREATMENT	ACRES LIBERATION- /REGENERA- TION TREAT- MENT	ACRES ASPEN REGEN- ERATION TREATMENT	TOTAL TREATMENT ACRES	TOTAL MILES ROAD CLOSURES
Proposed Action	3,118	289	463	3,870	42.4
Alternative A	2,532	289	463 *	3,284	42.4
Alternative B	4,322	289	463	5,074	42.4
Modified Alternative A	2,602	289	86	2,977	40.9

* For Alternative A, 377 acres of the 463 acres would involve only prescribed fire as the regeneration method.

B. Mitigation

In addition to the standards and guidelines in the Forest Plan, project specific mitigation measures described in the FEIS, Chapter Two, pages 5-8, will be implemented as part of this decision. Most mitigation requirements will be implemented as part of the Timber Sale Contract. The Timber Sale Contract (including sale area map) will be reviewed by ID team specialists, prior to implementation. The remaining mitigation measures will be completed during project lay-out or as part of post-sale plans.

C. Monitoring and Evaluation

Monitoring of management activities associated with the modified Alternative A will be implemented as described in appendix 12 of the FEIS. The Town of Brian Head and the Brian Head Ski Resort will be notified on a weekly basis to inform them where cutting, yarding and hauling will be taking place and the estimated time of completion. Monitoring of the harvest activities will be done on a daily basis by the Sale Administrator or Sale Inspectors.

D. Forest Plan Amendment

I have decided to adopt the proposed Forest Plan Amendment that will implement the Scenery Management System within the South SERP area.

III. REASONS FOR THIS DECISION

The rationale for this decision to implement recovery activities within currently roaded portions of the analysis area is as follows:

Implementation of the modified Alternative A best meets the Purpose and Need and moves the currently roaded area towards the desired future condition. It also meets the four resource objectives identified during the watershed assessment for the spruce ecosystem on the Cedar City Ranger District (page 1-1 and 1-2 of the FEIS).

I believe the modified Alternative A, with the included mitigation measures, provides the best balance between the various social and resource needs within the South SERP area at this time. This decision is driven by the need to recover valuable wood products, reduce fuel loads to desired conditions, allow for a more rapid rate of reforestation, and create a diversity in vegetative pattern, composition, and structure in the aspen and conifer forests.

The effects of the selected alternative and mitigation, as well as the effects of all alternatives and mitigation considered in detail, are described in Chapter Four of the FEIS. The selection of the modified Alternative A is consistent with standards and guidelines of the Forest Plan.

The rationale for the inclusion of the additional sites is to further reduce fuel loads, accomplish more rapid reforestation, and optimize economic recovery in the areas not associated with the roadless area. No additional road construction is required to access these sites.

The rationale for dropping some sites is to maintain wildlife habitat for species discovered during surveys in 1998.

The rationale for reducing the number of miles of roads closed is to improve recreational driving opportunities while reducing enforcement costs (see attached map - appendix 9). The roads that will remain open are located in areas with very little topographic relief, have good drainage and gentle grades and will provide for loop driving opportunities.

This decision eliminates 2.3 miles of temporary road construction to ensure compliance with the interim road rule.

The rationale for dropping the aspen regeneration by prescribed fire only is to ensure compliance with the direction contained in the 1999 appropriations bill which restricts burning on lands classified as timber base that could be removed in a commercially viable manner.

In my decision-making process, I relied upon an interdisciplinary team analysis of the alternatives including No Action, as documented in the FEIS. Selection of the modified Alternative A is based on the following considerations:

- A. Responsiveness to the Issues
- B. Responsiveness to Environmental Quality and the Purpose and Need
- C. Economic Efficiency
- D. Consistency with the Agency Mission
- E. Reason for Making Separate Decision Regarding Roadless Areas
- F. Compliance with the March 1, 1999 Forest Service Interim Road Rule
- G. How this Decision will Affect Roadless Areas

A. Responsiveness to the Issues

The public involvement and scoping for the South SERP has been extensive. Comments received during scoping were used to identify issues and develop alternatives that would address the issues. The following is a brief discussion of the issues identified during the scoping.

ISSUE ONE

This issue relates to proposed road construction within areas with undeveloped (roadless) characteristics. There is concern that increased access and timber harvesting will adversely affect recreational values, ecological integrity, wildlife, and increase erosion.

Alternative A was developed to respond to this issue; no roads will be constructed in the roadless areas under the modified Alternative A selected in this decision.

The number of roadless acres altered by harvesting activities are approximately 963 for the Proposed Action, 0 for Alternative A, and 2,013 for Alternative B. No acres would be altered by timber harvest under the modified Alternative A.

ISSUE TWO

This issue relates to the optimum economic recovery of wood products. There are two parts to this issue. First, to expedite the removal of wood products and second, to optimize the amount of wood products removed.

Based upon the comments received during the scoping and comment periods of the DEIS, the decision to select the modified Alternative A should expedite the removal of the beetle killed trees within currently roaded areas.

Concerning the second part of the issue, this decision treats an estimated 24 percent of the suitable and operable acreage predicted to be affected by the spruce beetle epidemic. I will address the remainder of the acreage in subsequent decisions.

B. Responsiveness to Environmental Quality and the Purpose and Need

The Purpose and Need of the Proposed Actions, is stated in Chapter One of the FEIS, on pages 1-4 and 1-5. I believe the modified Alternative A will best meet the project's stated Purpose and Need within roaded portions of the project area.

The Affected Environment section of the FEIS (Chapter Three), describes the resources within the South SERP area. Spruce beetle populations have increased from 1988 to the present and are expected to increase in the future. Forested stands within the project area are important to a variety of wildlife species. The timber industry is important to the tax base of Iron and Kane Counties and is dependent on the National Forests for wood fiber production. Recreation use in the project area including Brian Head Town is increasing and the trend is expected to continue.

Chapter Four, the Environmental Consequence section of the FEIS describes the direct, indirect and cumulative effects to resources by alternative, which includes No Action. Within the roaded portions of the analysis area, I believe the modified Alternative A best addresses the multitude of resource needs and is best suited to meeting the desired future condition for the project area. The modified Alternative A, in combination with the mitigation described in Chapter Two of the FEIS, would reduce the effects of harvest to the recreation related resource. The modified Alternative A was designed to optimize wood recovery in the roaded portion of the project area and to reduce effects to wildlife species discovered during the summer of 1998.

I believe implementation of the modified Alternative A will provide the greatest opportunity, in the long term, to maintain or recover recreation and scenic qualities, and establish a green, conifer forest. Areas impacted by spruce bark beetles will be regenerated by both artificial and natural regeneration. It is estimated that 1600 acres would require artificial planting with the remaining areas regenerating naturally.

Recovery of wood products that would otherwise be lost is an important element of the modified Alternative A. Depending on the level and progression of the beetle infestation in the selected Focus Areas, approximately 50.5 million board feet (MMBF) or 90,810 hundreds of cubic feet (CCF) could be harvested under the modified Alternative A, but not at the expense of other resource values such as those related to recreation and wildlife.

Removal of the dead and dying spruce trees through salvage harvest and prescribed fire will reduce short and long term fuel loads over the treated areas. This will reduce the short-term risk of wildfire occurrence and the long-term fire intensity risk in the project area outside of the Andesite Focus Area. Fuel load reduction in areas near subdivisions and other developments near and adjacent to the Andesite Focus Area will be addressed in subsequent decisions.

Closure of 40.9 miles of road will reduce the open road density within the analysis area to within the Forest Plan guideline of less than two miles per square mile.

Following my review of the resource discussions in the FEIS, especially those highlighted in Chapter Four concerning "Relationships Between Short Term Uses and Long Term Productivity", "Irreversible or Irrecoverable Commitment of Resources", and "Probable Adverse Environmental Effects that Cannot be Avoided", I believe the modified Alternative A will best balance the resource needs in the long and short terms.

The modified Alternative A moves the project area towards the desired future condition, meets the purpose and need for the project area, and addresses the issues identified except for optimum economic recovery.

C. Economic Efficiency

The costs and benefits of implementing a project of this nature are important factors to consider when selecting an alternative. Costs for a project similar to this are generally determined by the amount of road construction required, the yarding systems used to remove logs, the amount of essential reforestation, and the amount of cleanup needed, all relative to the amount of volume harvested. Benefits calculated in the economic analysis relate to the timber outputs produced. It is difficult to quantify costs and benefits associated with non-commodity resources for reasons discussed in the social/economic discussions in the FEIS for this project.

Approximately 58 million board feet (MMBF) or 104,490 hundreds of cubic feet (CCF) would be harvested under the Proposed Action, 50.5 MMBF or 90,810 CCF would be harvested under the modified Alternative A, and 75.4 MMBF or 135,700 CCF under Alternative B. I believe the modified Alternative A best responds to the economic and resource needs for the roaded portion of this project. It provides for 419 jobs, generates a present net value (PNV) of \$6,300,484 (4% interest rate), and an induced income of \$19,031,714.

Table B. Economic Effects (market resources), Measured by Present Net Value (PNV).

ALTERNATIVE	INTEREST RATE = +4%	INTEREST RATE = +7%	INTEREST RATE = +10%
Proposed Action	\$7,303,579	\$7,204,127	\$7,082,710
No Action	(\$3,413,211)	(\$3,406,644)	(\$3,400,435)
Alternative A	\$6,130,323	\$6,054,679	\$5,958,988
Alternative B	\$9,298,041	\$9,171,938	\$9,017,552
Modified Alternative A	\$6,300,484	\$6,214,721	\$6,110,236

*Numbers in parenthesis are negative values

There are some costs associated with this project that must be collected in order to protect and rehabilitate certain identified resource needs. Extensive slash cleanup is needed to reduce the visual impacts adjacent to roads and trails. Reforestation will also be needed in areas that are not adequately stocked following the harvest. The modified Alternative A generates the necessary revenues to complete this work while meeting other resource needs for the South SERP area.

D. Consistency with the Agency Mission

The mission of the USDA Forest Service is to manage lands for a variety of resource needs while providing for healthy ecosystems. Ecosystem management is an ecological approach to natural resource management. Management of ecosystems encompasses blending the biological and physical needs of that particular ecosystem, with the social and economic needs of the humans who use the ecosystem. I believe the modified Alternative A provides the greatest benefits to the roaded portion of South SERP by providing for the diverse needs of this area. Forest health, productivity, diversity, and scenic values are promoted while providing for other multiple-uses.

E. Reason for Making a Separate Decision for the Roaded/Developed Areas

Currently, there is considerable debate concerning building roads within roadless areas at the National level on Forest Service managed lands. Clarification of the interim road rule is necessary before making a final decision regarding the road building and harvesting activities within the undeveloped portion of the Andesite, Red Desert, and Long Valley Focus Areas.

F. Compliance with the March 1, 1999 Forest Service Interim Road Rule

I have reviewed the modified Alternative A and have determined that it is in compliance with the Interim Road Rule concerning new road construction, reconstruction, and road maintenance projects. There is 0.1 mile of road construction; none of this road is within a category of land suspended under the interim rule. Of the 51.0 miles of road reconstruction/maintenance identified on page 4-89 of the FEIS and approved under this decision, about 9.0 miles occur on classified roads (Forest development roads) within suspension category two of the interim rule. The 9.0 miles will access approximately 1,089 acres of salvage/improvement and 86 acres of aspen treatments within lands classified as suspension category two of the interim rule. The remaining 42.0 miles of road reconstruction/maintenance are on Forest development roads not within any category described by the interim rule.

G. How this Decision will Affect Roadless Areas

There are potentially two classes of roadless/unroaded/undeveloped lands which could be affected by the selected alternative:

1. Inventoried roadless areas: My decision will implement approximately 80 acres of salvage/improvement treatment within previously harvested acres of the original Hancock Peak Roadless Area (#07019). These acres were previously harvested in 1982 under the Sage Valley Timber Sale and have been excluded from the area shown on the undeveloped area map (appendix 7, FEIS).
2. Other undeveloped area identified during project analysis (Region Four Desk Guide for Roadless Area Inventory and Evaluation): No activities will occur on lands in this class.

IV. PUBLIC INVOLVEMENT

A. Public Participation

Public involvement for the South SERP was designed to solicit the concerns and comments of all interested parties. The program was implemented at two levels: A "programmatic" effort dealing with the entire issue of the bark beetle infestation on the Cedar City Ranger District which has been ongoing since 1992, and project-specific actions designed to meet the need for public involvement on the project proposals. Public involvement for this project included scoping letters, public meetings, field tours, news releases and phone contacts. A complete record of all public involvement is located in the Project File.

I appreciate the time and effort all interested parties spent participating in the analysis process. I especially appreciated those who took time out of their schedules to participate in the public meetings and field tours. I believe the information participants provided during these personal contacts was key to our understanding your feelings about this project. I hope the information provided gave everyone a better understanding of the purpose and need for this project.

B. Issues Identified

The scoping process was initiated in March, 1998. All scoping responses are included in the planning record. The ID Team analyzed and categorized the scoping responses into the following major issues:

Issue One - Resource effects of proposed road construction in roadless areas.

Issue Two - Optimum economic recovery of wood products.

C. Public Comments on the DEIS

On August 7, 1998 the South Spruce Ecosystem Rehabilitation Project Draft Environmental Impact Statement (DEIS), was sent to members of the public who had commented on the project, and elected officials. Seventeen written comments and five phone calls were received in response to the DEIS and can be found in the project file, exhibit 3. Comments made to the DEIS were broken into 60 separate comments. All comments were addressed individually. The public comments received and Forest Service response to the comments are documented in Chapter Eight of the FEIS for the South SERP.

V. ALTERNATIVES CONSIDERED

The analysis for the South SERP considered four alternatives in detail. The effects of these alternatives are discussed in detail in Chapter Four of the FEIS. An additional four alternatives were considered by the ID Team, but were not studied in detail. The rationale for the elimination of the alternatives not considered is discussed in Chapter Two of the FEIS. The alternatives not studied in detail and the four alternatives described in detail are fully discussed in Chapter Two of the FEIS and are listed below.

A. Alternatives Eliminated from Detailed Study

1. Use of density management silvicultural treatments to reduce risk of bark beetle infestation to live spruce stands.
2. Salvage only harvest.
3. Harvest from below alternative.
4. Prescribed or natural fire only.

B. Alternatives Considered in Detail, But Not Selected

Alternatives considered in detail were formulated from the issues identified during the scoping process, comments received during the DEIS review period, the project objectives and the goals, and objectives and desired future conditions of the Forest Plan.

No Action - The No Action alternative would not commercially remove beetle infested trees in the South SERP area. There would be no management activity to reduce fuel loading. The transportation system would remain the same and existing roads would remain in place. No prescribed burning, aspen regeneration, or road density reductions would occur. The No Action alternative does not meet the purpose and need as defined for this project.

Proposed Action Alternative - This alternative includes the road building and harvest treatments in roadless areas. A decision on management activities in these areas will be deferred pending agency clarification of the interim road rule.

Alternative A - This alternative was designed to address Issue One, i.e., the effects on areas with roadless characteristics. Alternative A does not recover economic value, reduce fuel loads, and reforest the optimum number of acres in the unroaded portion of the project area.

Alternative B - This alternative was developed to address Issue Two, i.e., the optimum economic recovery of wood products. Alternative B includes an increased amount of road building and harvest in roadless areas than the Proposed Action. A decision on management activities in these areas will be deferred pending agency clarification of the interim road rule.

VI. FINDINGS REQUIRED BY OTHER LAWS AND REGULATIONS

After consideration of the discussion of environmental consequences (FEIS, Chapter Four) and pending clarification of the interim road rule, I have determined that the modified Alternative A is consistent with other applicable laws and regulations, as outlined in the FEIS. Detailed discussions of laws and regulations are provided in the FEIS in Chapter Four pages 4-91 to 4-96.

A. Consistency with the Forest Plan Direction

Regulations and Requirements - All resources plans are to be consistent with the Forest Plan [16 U.S.C. 1604 (i)]. The Forest Plan guides all natural resource management activities [36 Code of Federal Regulations (CFR) 219.1 (b)]. All administrative activities affecting the National Forest must be based on the Forest Plan [36 CFR 219.10 (e)].

The Forest Plan was approved in September of 1986. The FEIS for the South Spruce Ecosystem Rehabilitation Project tiers to the FEIS for the Forest Plan. The Forest Plan provides the overall guidance for management activities by specifying goals and objectives, desired future conditions, management direction and standards and guidelines.

The features of the modified Alternative A have been evaluated against the goals and objectives of the Forest Plan, as well as the resource standards and guidelines, for consistency with the plan. All management activities included in the modified Alternative A are in full compliance with and in some cases exceed Forest Plan goals, objectives and standards.

B. Consistency with the National Forest Management Act

The modified Alternative A is consistent with the National Forest Management Act (NFMA) of 1976 in meeting the management requirements detailed in implementing regulations at 36 CFR 219.27 (a) through (g). Specifically, the management prescriptions for the modified Alternative A provide for protection of soil, water, air, wildlife, fishery resources and other multiple uses under 36 CFR 219.27 (a)(1) through (12). Additional discussion of NFMA consistency can be found on pages 4-91 to 4-95 of the FEIS.

C. Consistency with Other Laws and Regulations

Clean Water Act - The Clean Water Act requires each state to implement its own water quality standards. The State of Utah's Water Quality Antidegradation Policy requires maintenance of water quality to protect existing instream beneficial uses on streams designated as Category 1 High Quality Waters. All surface waters geographically located within the outer boundaries of the Dixie National Forest, whether on private or public lands are designated as High Quality Waters (Category 1). As such, new point sources will not be allowed, and non-point sources will be controlled to the extent feasible through implementation of Best Management Practices (BMPs) or regulatory programs (Utah Division of Water Quality 1994). The State of Utah and the Forest Service have agreed through a 1993 Memorandum of Understanding to use Forest Plan Standards & Guidelines and the Forest Service Handbook (FSH) 2509.22 Soil and Water Conservation Practices (SWCPs) as the BMPs. The use of SWCPs as the BMPs meet the water quality protection elements of the Utah Nonpoint Source Management Plan.

The beneficial uses and high quality of water in the streams draining the Project Area would be maintained during and following project implementation through the proper implementation of BMPs (SWCPs) as described in Chapter Two - FEIS.

Executive Order 11990 Of May, 1977 - This order requires the Forest Service to take action to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. In compliance with this order, Forest Service direction requires that an analysis be completed to determine whether adverse impacts would result.

The location of wetlands in the project area were identified in the delineation and inventory of sensitive watersheds. Impacts from adjacent or nearby areas will be prevented through implementation of SWCPs as described in Chapter Two (Mitigation). Any of the alternatives would be in compliance with Executive Order 11990.

Executive Order 11988 Of May, 1977 - This order requires the Forest Service to provide leadership and to take action to (1) minimize adverse impacts associated with occupancy and modification of floodplains and reduce risks of flood loss, (2) minimize impacts of floods on human safety, health, and welfare, and (3) restore and preserve the natural and beneficial values

served by flood plains. In compliance with this order, the Forest Service requires an analysis be completed to determine the significance of proposed actions in terms of impacts to flood plains.

Impacts from adjacent or nearby areas will be prevented through implementation of SWCP's as described in Chapter Two. Impacts related to road crossings will be minimized or prevented through implementation of SWCPs. All new roads proposed will be closed following project completion, and the natural stream courses will be reestablished. Therefore any of the proposed alternatives will be in compliance with Executive Order 11988.

Endangered Species Act Of 1973, As Amended - Based on discussions in Chapters Three and Four concerning threatened and endangered plant and wildlife species; correspondence with USFWS; and detailed discussions contained in the Biological Assessment located in the project file (exhibit 14), it has been determined that there would be no adverse effects to populations of threatened, endangered, or proposed wildlife or plant species relative to the modified Alternative A.

American Antiquities Act Of 1906 And Historic Preservation Act Of 1966 - Based on the discussions in Chapters Three and Four concerning Heritage Resources, and project file documentation (exhibit 21), it has been determined that there will be no measurable effects to any Historic Properties relative to any of the alternatives.

Clean Air Act, As Amended In 1977 - Based on discussions in Chapter Three and Four concerning Air Quality, it has been determined that there would be no measurable effects to air quality in class I or II airsheds relative to the modified Alternative A.

Forest and Rangeland Renewable Resources Planning Act of 1974 - Section 10, Part C of this act, under Transportation System, states that, "...any road constructed on National Forest System Lands in connection with timber contracts or permits shall be designed with the goal of reestablishing vegetative cover on the roadway and areas where the vegetative cover has been disturbed by the construction of the road, within 10 years after the termination of the contract, permit, or lease either through artificial or natural means." By following the mitigation measures specified, this provision of the Forest and Rangeland Renewable Planning Act would be met.

Civil Rights - Based on comments received during scoping and the comment period for the DEIS, no conflicts have been identified with other Federal, State, or local agencies or with Native Americans, other minorities, women, or civil rights of any United States citizen.

Secretary of Agriculture Memorandum, 1827 - The modified Alternative A is in conformance for prime farmland, rangeland and forest land.

Energy - The modified Alternative A would not have unusual energy requirements.

Mining - The modified Alternative A would have no effects on the availability of lands for mining, under federal mining laws and regulations.



Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations." - This order requires the Forest Service make achieving environmental justice part of its mission by identifying and addressing as appropriate, disproportionately high and adverse human health effects, of its programs policies and activities on minority populations and low-income populations in the United States and territorial possessions. In compliance with this executive order, The Dixie National Forest, through intensive Scoping and Public Involvement attempted to identify interested and affected parties, including minority and low-income populations for this project. The Forest defined a range of alternatives to be evaluated and analyzed the consequence of the alternatives on the quality of the human environment. A comment period was held for 45-days for the Draft Environmental Impact Statement following the U.S. Environmental Protection Agency's publication of the Notice of Availability in the Federal Register.

The land described in this analysis is managed by the USDA Forest Service as the Dixie National Forest. The decision for this document will not amend or preclude any existing private or treaty rights in the South SERP Project Area. No minority or low-income populations were identified during public involvement activities (Scoping and DEIS Comment Period) in the City of Brian Head, Meadow Lake Estates, Rainbow Meadows Rancho/Ireland Estates, Greater Mammoth Creek Subdivision, Greater Duck Creek Village and Strawberry Point subdivision, which are communities near or immediately surrounding the South SERP Project Area.

VII. ENVIRONMENTALLY PREFERRED ALTERNATIVE

The environmentally preferred alternative best meets the following six goals as stated in the National Environmental Policy Act (Title 1, Section 151 (b)):

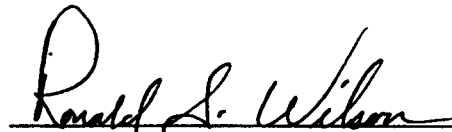
1. Fulfills the responsibilities of each generation as trustee of the environment for succeeding generations.
2. Assures all Americans safe, healthful, productive and aesthetically and culturally pleasing surroundings.
3. Attains the widest range of beneficial uses of the environment without degradation, risk to health or safety, or other undesirable and unintended consequences.
4. Preserves important historic, cultural and natural aspects of our national heritage, and maintains wherever possible, an environment which supports diversity and a wide variety of individual choices.
5. Achieves a balance between the human population and resource uses which permits high standards of living and a wide sharing of life's amenities.
6. Enhances the quality of renewable resources and approaches the maximum attainable recycling of depleted resources.

All action alternatives fulfill the six goals as stated above, at least to a minimum degree. However, the modified Alternative A provides the best overall balance for the fulfillment of these goals at this time.

VIII. IMPLEMENTATION AND ADMINISTRATIVE REVIEW

This decision is subject to appeal pursuant to Forest Service regulations at 36 CFR 215.7. A written notice of appeal must be postmarked or received by the Appeal Deciding Officer, Regional Forester Jack Blackwell, USDA Forest Service, 324 25th Street, Ogden, UT 84401, within 45 days after the date this notice is published in *The Daily Spectrum*, St. George, UT. Appeals must meet the content requirements of 36 CFR 215.14.

For further information on this project, contact Stephen R. Robertson, Acting District Ranger, Cedar City Ranger District, 82 North, 100 East, P.O. Box 627, Cedar City, UT 84720, or phone (435) 865-3200.



RONALD S. WILSON
Acting Forest Supervisor
Dixie National Forest

Date 6/10/99

SUMMARY OF THE FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED SOUTH SPRUCE ECOSYSTEM REHABILITATION PROJECT

Project Area

The South Spruce Ecosystem Rehabilitation Project (South SERP) area is the southern portion of the spruce ecosystem on the Northern Markagunt Plateau within the Dixie National Forest, Cedar City Ranger District. Activities were previously proposed and authorized within the northern portion of the spruce ecosystem under the Spruce Ecosystem Recovery Project (SERP) and accompanying decision (February 1998). The South SERP project area comprises the southern 22,783 acres of SERP. The area is located approximately 20 air miles east of Cedar City, Utah, and is immediately adjacent to Cedar Breaks National Monument.

The 52,991 acre SERP area is located in the upper drainages of the Parowan, Mammoth, Panguitch, Asay and Coal Creek watersheds. Elevations range from 7900 feet at the north end of the project area to 11,307 feet at Brian Head Peak. The forest type is primarily Engelmann spruce/subalpine fir, with a strong component of aspen. The forested areas are interspersed with meadows, basalt flows, and cinder cones. There are 37,577 acres of forest, 15,414 acres of non-forested land, and 22,951 acres of suitable forested land. There are 4,621 acres of unsuitable land, and 372 acres unclassified. Suitable lands are areas where management practices are appropriate.

State Highways 14, 143 and 148 traverse the project area. Brian Head Town is adjacent to the project area on the north boundary. Legal description for the project area include all or part of sections 28-33 of Township (T) 35 South (S), Range (R) 8 West (W), 3-17, 20-24, 26-35 of T36S, R8W; 3-10, 15-21, 30-32 OF T37S, R8W; 1,2, 11-14, 23-26, 35 and 36 of T37S, R81/2W; 3-6, 8-15, 24, 25 and 36 T36S, R9W; 10-16, 22-27, 35 and 36 T37S, R9W, Salt Lake City (SLC) Meridian, Iron County, Utah; and, sections 1 and 2 T38S, R9W; 5 and 6 T38S, R8W, SLC Meridian, Kane Co., UT.

Purpose and Need for Action

1. There is a need in the conifer forests in the project area to improve forest health and ecosystem function by improving species diversity, forest structure and pattern characteristics in areas affected by spruce beetle mortality. The proposed treatments will recover valuable wood products, reduce fuel loads to desired conditions, allow for a more rapid rate of reforestation, and liberate or stimulate existing aspen regeneration, and change the linear pattern of sites in previously harvested areas.
2. There is a need in the aspen component to:
 - a. Increase species diversity across the landscape to reduce catastrophic losses associated with forest pests or fire. The abundance of spruce in a structural stage susceptible to spruce beetle has resulted in a large loss of the overstory component in infested areas. Spruce beetle's primary host is spruce; the spruce beetle has little to no effect on non-host species such as aspen or fir. Increasing the non-host component and varying size class structure will reduce large-scale landscape impacts in the long-term. Maintaining a diverse forest structure and increasing species diversity will reduce forest susceptibility to these catastrophic events.
 - b. Improve visual form, color and textural diversity in the landscape. Fall color in aspen is a major factor in making southwest Utah "Color Country." Loss of aspen across the landscape would reduce the visual impact and recreational opportunities associated with aspen.
 - c. Improve structural vegetative diversity for wildlife. Aspen forests are important habitat for many species of mammals and birds (including goshawks), especially in the Interior West where aspen is the only upland hardwood species. Aspen ecosystems provide forage for wildlife in conifer-dominated environments. Aspen is also used for hiding and thermal cover for big game.

3. Changes in travel management objectives are needed to:
 - a. Reduce adverse impacts to soil, watersheds, and wildlife by closing some roads.
 - b. Reduce long-term road maintenance costs while promoting safe, efficient travel on open roads.
4. A Forest Plan amendment is needed to:
 - a. Adopt Scenic Integrity Objectives for the Management Areas in this project area.
 - b. Adjust the boundaries of the management areas that emphasize recreation (1A, 2A and 2B) to reflect the Scenery Management System inventory and analysis.

Proposed Action

The Dixie National Forest proposes three activities within the South Spruce Ecosystem Rehabilitation Project (South SERP) to meet the purpose and need:

- (1) conifer forest treatments including commercial tree harvest, forest regeneration activities, fuelwood removal or burning, chemical and biological control of spruce beetle populations, and road construction/reconstruction required to support commercial harvest treatments;
- (2) aspen forest treatments including commercial tree harvest, fuelwood removal, and prescribed fire to stimulate aspen regeneration; and
- (3) reduction in road densities through temporary and permanent closure of existing open roads, and additional measures for previous road closures that have proven ineffective. The activities are proposed to occur within five focus areas. Tables A and B display the activities proposed by focus area.

Table A: Focus Area Acreage by Treatment

FOCUS AREAS	ACRES SALVAGE/ IMPROVE- MENT TREATMENT	ACRES LIBERATION/ REGENERAT- ION TREATMENT	ACRES ASPEN TREATMENT	TOTAL TREATMENT ACRES	TOTAL FOCUS AREA ACRES
Andesite	730			730	10448 (593 private)
Long Valley	1483		210	1693	5087
Radar Ridge	179			179	1843
Deer Valley	726	289		1015	4556
Red Desert			253	253	849
Total	3118	289	463	3870	22783

Table B: Road Miles and Densities by Focus Area

FOCUS AREAS	CURRENT OPEN ROAD MILES	PROPOSED OPEN ROAD MILES	CURRENT ROAD DENSITY (miles of road per square mile)	PROPOSED ROAD DENSITY (miles of road per square mile)
Long Valley	27.4	10.4	3.39	1.29
Deer Valley	42.1*	12.4	5.91	1.74
SERP	193	150	2.33	1.82

* 3.3 miles of road will be closed under the Midway Face Viewshed Management EA

A Forest Plan amendment is proposed to designate Scenic Integrity Objectives (SIO) using the Scenery Management System (SMS), and adjust the boundaries of Management Areas 1A (Developed Recreation), 2A (Semi-Primitive Recreation), and 2B (Rural and Roaded Recreation Opportunities). The boundary adjustments will better implement the intent of the Forest Plan for providing for recreation.

Forest Plan Direction

The South SERP FEIS analysis incorporates direction provided in the Dixie National Forest Land and Resource Management Plan (Forest Plan) (1986). The Forest Plan guides natural resource management activities through goals and objectives, standards, and guidelines.

The Forest Plan places 44 percent (23,029 acres) of the entire SERP area within the General Forest Management Area (1), three percent (1,376) in the Winter Sports Sites Management Area (1B), 19 percent (9,969) in the Semi-Primitive Recreation Area (2A), 10 percent (5,548) in the Rural and Roaded Recreation Opportunities Management Area (2B), three percent (1,371) in the Livestock Grazing Management Area (6A), 12 percent (6,300) in the Timber Management Area (7A), one percent (403) in the Riparian Management Area (9A), less than one percent (239) in Developed Recreation (1A), Fish and Aquatic Habitat (4A), Wildlife Habitat (4C), Municipal Water Supply Watersheds Management Areas (10B), and nine percent (4,747) within private lands.

Management Objectives

Activities proposed within the project area contribute to meeting the goals and objectives, management direction, and standards and guidelines found in the Forest Plan. For each resource area identified during preliminary analysis, activities are designed to move existing conditions toward the desired future condition.

A broad-scale watershed assessment was completed to describe existing conditions and determine the desired condition of the resources within the project area. This assessment area covered approximately 427,000 acres of National Forest System watersheds that also encompassed private, state, and other federal ownerships. The assessment showed that forest health conditions were declining. Management activities proposed within the project area were developed to address the situation. The assessment is included in the project file (exhibit 36) for the South SERP analysis and is available upon request for review. Although all desired resource conditions were identified and used to develop proposed activities, the following were key in the assessment:

1. Maintain forest conditions which provide for an appropriate number of trees on a site (stocking) with the desired structure and age class distribution, species composition and diversity, and patterns (size, shape, location) to meet a variety of resource needs identified within the proposed project area. Achieving desired forest conditions will reduce the long-term risk of catastrophic loss due to insect, disease or wildfire.
2. Maintain sufficient numbers of standing snags and downed logs of various size class and species. This will provide important habitat for diverse plant and animal communities, and ensure a sufficient quantity of organic matter for soils.
3. Maintain a strong representation of intact forest soils, while emphasizing organic surface layers and coarse woody debris important to maintaining site productivity.
4. Maintain road conditions and locations to assure resource protection for soil and water resources. Minimize motorized open-road densities to meet resource objectives (equal to or less than two miles of road per square mile).

Detailed documentation of all resource considerations from the watershed assessment is located in the project file and is available upon request.

Decisions to be Made

The Forest Supervisor of the Dixie National Forest is the responsible official for making decisions on the proposed South SERP. The Forest Supervisor will decide to do one of the following:

- approve the recovery activities presented in the Proposed Action
- approve one of the action alternatives to the Proposed Action

- select a combination of alternatives in this document
- select the No Action alternative for an indefinite period, or until another analysis is completed.

The Forest Supervisor will also approve mitigation measures to reduce resource impacts associated with implementing activity.

The proposed Forest Plan amendment is included in all action alternatives. Multiple decisions may result from this analysis.

Public Involvement

Forest health issues have resulted from current bark beetle activity on the Cedar City Ranger District. Large-scale changes in forest structure may prevent attaining resource management goals or meeting public use objectives. Resource goals associated with social values and desired future condition may be adversely affected.

Since 1992, the Dixie National Forest has provided information and responded to questions from thousands of people regarding bark beetle biology and the effect epidemic populations have on forest resources. This information has been provided through letters, newspaper articles, public service messages, telephone calls, public meetings and field trips. The public has been invited to comment and participate in project planning efforts to address spruce beetle mortality and associated risk of infestation to green trees. This public involvement effort is continuing with the South SERP and is detailed in the public involvement record in the project file (exhibit 9).

Issues

The Interdisciplinary Team (IDT) developed the following issues from scoping. They were used in the formation of alternatives:

Issue One

Proposed road construction. Increased access into areas currently undeveloped could adversely affect recreational values, wildlife habitat, water quality and yield, and increase soil erosion.

Comparison Criteria for Issue One: 1) miles of constructed roads which will be closed, where road remains intact within areas with undeveloped characteristics, 2) number of acres altered by commercial or fuelwood harvesting in areas with undeveloped characteristics, 3) road densities in the South SERP focus areas.

Issue Two

Optimum economic recovery of wood products. There are two parts to this issue: expedite the removal of the spruce beetle killed trees to optimize sawtimber value (which declines two years following infestation); maximize the amount of beetle-killed trees removed.

Comparison Criterion For Issue Two: Percentage of harvest acreage compared to available acres of spruce mortality on suitable and operable acres.

Description of Alternatives

In order to consider a reasonable range of solutions to the issues, the Interdisciplinary Team developed eight potential alternatives. Four of these alternatives were "considered, but not studied in detail". The reasons why they were not carried forward for "detailed consideration" is described below. Following this discussion is a description of the three alternatives that are "considered in detail", in addition to the Proposed Action.

Alternatives Considered, but not Studied in Detail

1. Use of density management silvicultural treatments to reduce risk of bark beetle infestation to live spruce stands.

Proposed harvest treatments were developed following monitoring of previous treatments in areas first affected by the spruce beetle epidemic (Sidney Valley and Rainbow Meadows). Early treatments of small areas or leaving clumps of

spruce to meet density requirements were not effective in reducing susceptibility to beetles, particularly when treated sites were exposed to outbreak populations of spruce beetle. Silvicultural treatments designed to reduce risk did not result in low risk sites or were implemented after a site had been infested by spruce beetle. As the mortality expanded in the infested stands, additional harvesting was necessary to meet fuel loading and reforestation objectives. Some of the sites in the Sidney Valley and Rainbow Meadows timber sale areas were harvested three times. Multiple entries such as this would not occur under the proposed treatments for South SERP. It is more efficient and desirable ecologically to enter an area once rather than several times.

During the SERP analysis, the Hancock Peak area was identified as an area that, with further treatment, may result in a site with stand conditions close to low risk specifications. The area had been logged and precommercially thinned in the late 1980's and early 1990's. The spruce trees in the area had responded to the reduction in densities by a subsequent increase in growth rates. During the beetle flight of 1997, however, much of the area became infested by spruce beetles and, following field reviews by the IDT and Forest Service entomologists, the decision was made to abandon subsequent efforts at density reduction treatments. The IDT concluded that thinning strategies should be initiated well in advance of a spruce beetle outbreak in order to be effective. If thinning options were considered, spruce sites in close proximity to an existing outbreak should be thinned before becoming infested to low or low-moderate risk specifications.

Because of the flight behavior of spruce beetle, extent of the infestation and existing epidemic populations on the District, this alternative was not evaluated further.

2. Salvage only harvest.

Given the scale of the bark beetle epidemic and the effects to forest structure, composition and pattern, as well as the desire to retain a live, green tree component where possible, this alternative was considered. However, this alternative would not meet the purpose and need to improve overall forest health and ecosystem functions by not treating the live, non-spruce component (aspen, alpine fir). Previous treatments within the SERP area did not allow for removal of non-host species and resulted in post harvest stand conditions which were conducive to windthrow and poor utilization of material that was damaged or felled during harvest operations. The opportunity to improve growth and vigor of sapling sized spruce or increase the representation of spruce by removing some alpine fir would also not be feasible under this alternative. Not treating alpine fir results in an acceleration and conversion to alpine fir on some site's which is not as ecologically desirable as spruce. For these reasons, this alternative will not be considered for further analysis.

3. Harvest from below alternative.

An alternative based on retention of the large diameter component of the treatment areas was considered. This alternative would allow some commercial cutting but would not allow removal or cutting of any trees greater than 16 inches in diameter while retaining all snags that existed prior to beetle infestation. This alternative does not accomplish the purpose and need of the project of reducing fuel loadings and recovering wood products. In previously untreated areas, it is estimated that 60 to 80 tons per acre of dead material would be left on the site under this alternative. The desired condition is to leave 15 to 20 tons per acre in the spruce-fir forest type. The economic efficiencies of designing and implementing a logging system to thin dead trees from below would be prohibitive given the high densities of material greater than 16 inches in diameter. Based on stand examination data, the average diameter of spruce trees in the proposed treatment areas typically exceed 18 inches in diameter and stocking densities of trees greater than 16 inches in diameter exceed 75 trees per acre (project file, exhibit 18). Implementation of this alternative could be more feasible in forest types deficient in large diameter trees (i.e. ponderosa pine). For these reasons this alternative will not be considered for further analysis.

4. Prescribed or natural fire only.

An alternative that would use only prescribed or natural fire to accomplish the purpose and need of the project was considered. This alternative would not allow for any economic recovery of wood products from the aspen or spruce beetle affected sites in the focus areas. In the spruce-fir areas fire typically occurs on a 200 to 300 year cycle and burns with high intensity and severity. Although wildfire is a natural occurrence, high intensity/severity fires are undesirable for some resources. Soil productivity and revegetation rates can be adversely affected when high severity fires burn into the duff layer in this forest type. The introduction of the human dimension into this ecosystem with seasonal and permanent residences in town and unincorporated subdivisions, recreationists, and other structure developments reduces the temporal and spatial scales that natural fires can safely be allowed to burn.

Prescribed fire in this forest type under controlled burning conditions is a more feasible management tool and is approved for use under the SERP EIS to accomplish the fuels reduction objectives over a limited spatial scale. However

to use prescribed fire as the primary fuels reduction tool at the extensive spatial scales required to meet purpose and need, would carry a relatively high inherent risk of escape that could threaten structures and air quality, and risk of excessive burning intensity that could adversely affect soils and slow revegetation. The use of fire only in the spruce-fir type does not accomplish the purpose and need of economic recovery and could adversely affect the rate of reforestation.

In the aspen forest type, fire occurs on a more frequent interval and with lower intensity than fires in the spruce-fir type. As described in this EIS, fire stimulates aspen suckering under low to moderate burning intensities that will accomplish the purpose and need of aspen regeneration. The aspen response to fire will occur with or without the use of mechanical treatments prior to burning. However, fire alone would not accomplish the purpose and need of economic recovery within the aspen type. For these reasons this alternative will not be considered for further analysis.

Alternatives Considered in Detail

The IDT developed the proposed action, no action and two action alternatives for detailed analysis. Specific mitigation measures and management requirements for all action alternatives are detailed in Chapter Two of the FEIS.

Proposed Action

Several activities are proposed to move the project area toward the desired condition and meet the purpose and need of the project. These include: 1) Timber Harvest, 2) Travel Management, and 3) Aspen Regeneration (see figure 2).

Activities Proposed

- 1. Treatments in conifer forests, including commercial tree harvest, forest regeneration activities, fuelwood removal or burning and road construction/reconstruction required to support commercial harvest treatments.**

Activities common to all focus areas described below: Over the next five years about 730 acres of currently or recently infested spruce stands (figure 2) are proposed for commercial harvest to remove infested trees or trees identified as high risk (larger diameter hosts adjacent to infested trees). Less than 15 percent of all trees removed will include subalpine fir. The majority of harvested fir will be removed under an improvement cut to release healthy aspen, spruce or subalpine fir regeneration, or improve residual stand vigor. Subalpine fir that will likely be damaged or killed during the harvest of spruce trees will also be removed. In the Deer Valley Focus Area approximately 289 acres of spruce-fir is proposed for removal to liberate existing aspen regeneration, stimulate new aspen suckering, and to modify the linear pattern of the timber stands. Approximately 2677 acres of the spruce component is rated moderate to high risk to spruce beetle infestation and are located adjacent to infested areas proposed for commercial salvage and improvement cuttings. These 2677 acres are currently uninfested and will not be harvested until they are infested by epidemic levels of spruce beetle. Proposed treatments will include ground based and aerial yarding systems used during the summer, fall, and winter seasons.

Spruce beetle created openings in approved treatment sites will initiate regeneration activities. Regeneration includes site preparation activities which are; broadcast burning, slash piling and burning, felling of dead trees to provide microsites for regenerating trees, and hand removal of ground debris to allow planting of new trees. Following site preparation, new trees will be planted using seeds collected within appropriate seed zones for the area, or left to regenerate naturally.

Due to the extent of the spruce beetle caused mortality, many affected areas would drop below forested minimum stocking levels. Proposed harvest activities in these areas will create an opening which, if over 40 acres in size, would not be in compliance with the Forest Plan standard and guideline concerning created openings (IV-40). The Regional Forester has granted the Dixie National Forest a programmatic exemption relative to the requirements in the Intermountain Regional Guide for openings caused by insect epidemics (see appendix 13 of FEIS).

Prescribed fire will be used in all commercial harvest units to reduce slash created by harvest. Slash will be hand or machine piled and burned.

Focus Area activities: The South SERP area has been subdivided into five focus areas (FA) called: 1) Andesite, 2) Red Desert, 3) Radar Ridge, 4) Long Valley, and 5) Deer Valley. Management areas (MA) include: 1 (general direction), 1A (recreation sites), 2A (semi-primitive recreation), 2B (rural and roaded recreation), and 7A (wood production and utilization). A description of each FA and associated proposed activities are described below:

- a. Andesite (10,448 acres) - Management areas (MA): 1 - 1,667 acres, 2A - 8,022 acres, 7A - 161 acres, and private - 592 acres

The Andesite Focus Area is on the northern perimeter of the Hancock Peak undeveloped area and adjacent to Cedar Breaks National Monument. A portion of this focus area was also included in the SERP and the decision was made to use prescribed fire in 2,795 acres of the FA after the sites were infested with spruce beetle. Most of this focus area is currently infested, primarily by the 1997 and 1998 flight of adult beetles. The 1999 beetle flight is expected to result in attacks on the residual larger diameter (> 6 inches in diameter) green spruce. Approximately 730 acres are proposed for commercial harvest. Harvest activities will occur adjacent to a portion of the Hancock Peak Trail.

Approximately 1.7 miles of specified road and 1.3 miles of temporary road are proposed for construction to facilitate harvesting in this FA. New roads will be gated closed during project implementation and physically closed upon completion of project activities. An administrative closure for the MA 2A portion of this focus area will in place during project implementation to restrict public motorized access. Access to some treatment areas will require use of Highway 148 through Cedar Breaks National Monument. No treatment activities will occur on private land. Implementation of activities in this focus area is planned for 1999.

- b. Red Desert (849 acres) - Management Areas: 1 - 433 acres and 2A - 416 acres

Within this Focus Area, 253 acres of aspen regeneration treatments would occur as described below. Approximately one half mile of temporary road will be required to facilitate personal/commercial fuelwood operations, or sawtimber removal in this FA. Roads will be closed and obliterated upon completion of project activities.

- c. Radar Ridge (1,843 acres) - Management Areas: 1 - 1,390 acres, 2B - 453 acres

Activities in this Focus Area will include 179 acres of salvage/improvement treatments. Small isolated pockets of beetle activity were observed in this focus area in 1998. Beetle populations are expected to increase in the focus area as populations expand from infestations on the northern portion of the SERP area. This area has not been previously treated and is adjacent to the Ashdown Gorge Wilderness Area. Some of the proposed treatment areas in this FA are located within areas classified as category 4 of the interim road rule which restricts additional road construction. Approximately .5 miles of road construction is proposed in this FA in the area outside of category 4 lands (see appendix 7 of FEIS). Access to some of the treatment areas will be through the State of Utah maintenance facility and along the powerline maintenance corridor. The gate into the facility will be closed during harvest activities. Use of Forest Road # 2105 will be changed to administrative use only and closed to the public. Access will be controlled with a gate at Highway 148 and used primarily for maintenance of the powerline to the facilities at the top of Radar Ridge. If the area becomes infested with epidemic populations of spruce beetle, proposed treatments could occur by 2000.

Bark beetle control measures to meet scenic value objectives will be implemented along State Highway 148 between the junction of state Highway 14 and the southern boundary of Cedar Breaks National Monument. Control measures will include insecticide treatments (carbaryl) and the use of spruce beetle anti-aggregate pheromones. Up to 10 acres would be treated or approximately 1000 trees. Carbaryl is applied by hand spraying individual trees up to approximately the first 50 feet of the bole of the tree. Pheromones are applied by placing the product on each individual tree by hand. Use of pheromones are experimental and are approved for use under category 31.1a(3) "Inventories, research activities, and studies...", Forest Service Handbook 1909.15.

- d. Long Valley (5,087 acres) - Management Areas: 1 - 656 acres, 2A - 71 acres, 2B - 1,578 acres, and 7A - 2,782 acres

Proposed treatments in this FA include salvage/improvement and aspen regeneration. Harvest activities will occur in sites previously harvested. As of 1998, spruce beetle populations were still low in this FA, but are expected to increase with adult beetle flight activity in 1999 and beyond. The existing transportation system will access the estimated 1,483 acres proposed for treatment. Maintenance and minor reconstruction/relocation will occur on existing roads to facilitate harvest including. Approximately 17 miles of existing roads are proposed for closure upon completion of project activities. Approximately 210 acres are proposed for aspen regeneration. Implementation could occur by 2000 if the FA is infested with populations of spruce beetle.

- e. Deer Valley (4,556 acres) - Management Areas: 1 - 10 acres, 1A - 120 acres, 2B - 1,069 acres, and 7A - 3,357 acres

Activities in this FA include the proposal to salvage/improvement cut 726 acres of which 406 were previously harvested areas, and liberate/regenerate 289 acres of aspen. The 726 acres would be treated only if they became infested by spruce beetle. Low spruce beetle populations were observed in this FA in 1998, but are expected to increase with adult beetle flight activity in 1999 and beyond. The areas designated as aspen liberation/regeneration depicted in figure 2 would proceed regardless of spruce beetle activity. The existing transportation system is sufficient and no new roads will be constructed in this FA. Maintenance and minor reconstruction would occur on existing roads to facilitate harvest. Approximately 25.4 miles of existing roads are proposed for closure upon completion of project activities. The aspen liberation/regeneration proposal treatments could occur by 1999. If the FA becomes infested, the salvage/improvement treatments could occur by 2000 on the other sites.

Commercial Post-Harvest Treatments

Initial commercial salvage and improvement operations are projected to start in 1999 and end no earlier than 2005. No additional commercial post-harvest treatment work is proposed to occur under the project.

Non-Commercial, Pre- And Post-Harvest Treatments

Fuel reduction. Fuel (down woody material less than 3 inches in diameter) will be hand piled along all primary bike/hiking trails, State Highways U-148 and 14 and all arterial and collector roads that will remain open. This area generally encompasses up to 100 feet on either side of trail/road. However, it could be extended to 200 feet depending on terrain visibility. Refer to mitigation measures (page 2-6) for details on size and the amount of material that would be treated. Visibility distance will be primarily dependent on the degree of bark beetle mortality in the immediate foreground and damage to residual trees during the harvest operations. Approximately 10 acres of hand piling will occur.

Slash from road construction/reconstruction will be piled and burned, buried or scattered.

Slash greater than 3 inches in diameter in areas outside of the areas previously described that exceeds 15-20 tons per acre will require machine piling. In all treatment areas slash will be lopped and scattered to a maximum depth of 24 inches. Some degree of lop and scatter will probably occur on all 3407 acres proposed for conifer treatment. Approximately 824 acres of machine piling will occur.

All landing areas would be machine piled and burned.

Approximately 1287 acres of burning will occur as a result of the fuels or aspen treatments discussed above (Andesite - 154 acres, Red Desert - 253, Radar Ridge - 45, Long Valley - 581, Deer Valley - 254).

Post-harvest reforestation. At the conclusion of salvage operations, approximately 1738 plantable acres will probably not meet fully stocked levels required to attain desired future condition. To move the area toward the desired future condition and meet size class diversity/species diversity objectives, understocked areas will be replanted with Engelmann spruce to supplement the existing and expected natural regeneration of spruce, subalpine fir and aspen. On plantable acres, aspen and subalpine fir will be allowed to represent up to 50 percent of the species mix. The timing of supplemental planting will be determined by a certified silviculturist on a site by site basis, dependent primarily on needs and the availability of funding (KV versus appropriated funding). The 1738 plantable acres are distributed as follows: Andesite - 310 acres, Red Desert - 0, Radar Ridge - 143, Long Valley - 741 and Deer Valley - 544.

Post-treatment timber stand improvement. Precommercial thinning will not occur; however, damaged tree cleanup will be completed as necessary over the treatment areas. Damaged trees are often associated with commercial harvest entries. Most of the clean-up activity will be conducted by the contract purchaser using B and C provision requirements.

Transportation System. To salvage dead spruce, approximately 4.4 miles of specified road construction will occur (figure 2). Also, approximately 54.7 miles of existing roads will require pre-haul maintenance, which includes blading and drainage clean-out. (Refer to appendix 9 of FEIS for the existing transportation systems within the project area). New roads will be gated closed during project implementation and physically closed after project activities are concluded to meet current road density and MA 2A objectives. Techniques to close roads include; restoring road approach contours to their original shape, gates, and earth/rock barriers, using existing topography and vegetation to improve closure effectiveness. Approximately 42.4 miles of existing roads in the Long Valley and Deer Valley Focus Areas are proposed for closure. Some roads proposed for closure (appendix 9 of FEIS) will be obliterated, returned to

contour and, where necessary, reseeded. Roads in this category are currently open and will be used for project implementation. All landing sites, roads, and major skid trails will be revegetated using an appropriate seed mix.

2. Aspen treatments - Aspen forest regeneration as a result of commercial tree harvest, fuelwood removal, and prescribed fire.

Proposed aspen regeneration treatments will occur over five years and encompass up to five percent (463 acres) of the estimated 9181 acres of existing aspen type identified in the project area. Aspen regeneration treatments will occur within the Long Valley and Red Desert Focus Areas. Approximately one mile of temporary road construction is associated with this proposal (.5 mile in the Red Desert and .5 mile in the Long Valley FA's - figure 2).

Aspen regeneration treatments will include the use of fire and mechanical activities to encourage aspen resprouting.

- a. Prescribed fire will be used to remove 90 percent of the standing aspen trees in a treatment area.
- b. Mechanical treatments with prescribed fire includes both commercial and noncommercial fuelwood removal. Commercial patch cut or clearcut harvest treatments may be used in blocks up to 40 acres where priority areas are accessible (within 1/4 mile of an existing or constructed road) and contain sufficient quality and volume of aspen to make it economical to harvest. Prescribed fire will be used following mechanical treatments where fuel loadings allow.

3. Travel management - reduce road densities as a result of temporary and permanent closure of existing, open roads and using additional measures on ineffective previous road closures.

Reduce road densities within the SERP area to Forest Plan Guideline of less than two miles of road per square mile. Road closures are proposed on 42.4 miles of roads within the Long Valley and Deer Valley Focus Areas (figure 2). Road closure measures could include earth/rock barriers, gates, and obliteration, using topographic features and vegetation to improve effectiveness. Many of the roads proposed for closure are required for future resource management and therefore will be closed but not obliterated. These temporary road closures will remain in the Forest transportation system. Monitoring road closures is also planned and additional measures to ensure closure will be used if necessary.

Current road density within the Long Valley FA is 3.39 miles per square mile. Proposed closures will result in a density of 1.29 miles per square mile. In the Deer Valley FA current road density is 5.91 miles per square mile and will be reduced to 1.74. This reduction in road density will bring the road density for the SERP area to approximately 1.82 miles of road per square mile. The other FA's within the South SERP area are presently at or below 2.0 miles of open road per square mile.

A review of the road system indicates that no proposed road closures are affected by RS 2477 claims by Iron or Kane Counties.

No Action (Current Management)

An analysis of the "No Action" alternative is required by regulation and is therefore a part of this EIS. The following characteristics would apply to the "No Action" alternative.

- Activities approved under the SERP EIS would be implemented.
- No commercial removal of beetle killed or infested/susceptible trees would occur. Aspen would not be regenerated and no changes in travel management would occur.
- The transportation systems (FS trails and roads) would remain the same. No new roads would be built or reconstructed. Existing road systems would remain in place.
- No management activity would occur to reduce fuel loading.
- Current management would continue, including harvest activities along existing roads for fuelwood, post and poles.

- There will be no additional recreation restrictions other than those associated with the current recreation program.
- No receipts and associated revenue would be collected from harvest activities to rehabilitate landscapes or reforest created openings caused by spruce beetle mortality. All reforestation will occur as a result of natural processes.
- If the South SERP area becomes infested with spruce beetle, approximately 14,809 acres of dead trees would be left standing.

Alternative A - see attached document

Alternative B - see attached document

Proposed Forest Plan Amendment

In addition to activities previously described, a site specific amendment to the Forest Plan is proposed under all action alternatives. The amendment is necessary to facilitate implementing the Scenery Management System (SMS) in this project area.

Former Forest Service Chief Jack Ward Thomas directed the Forest Service to use the Scenery Management System (SMS) as the analysis and management process for scenic resources, replacing the Visual Management System. As directed in Thomas' December 1995 letter (project file, exhibit 19), this project will implement the SMS within the South SERP area and amend the Forest Plan on a site specific basis as shown in appendix 2A of the FEIS. This includes adopting the Scenic Integrity Objectives for Management Areas in the South SERP area, which will replace the Visual Quality Objectives (VQO's) specified in the Forest Plan. The effects of the new management direction as it applies to current Forest Plan Standards and Guidelines is analyzed in Chapter Four under the Scenery Management section.

Also included is an adjustment to the Management Area boundaries to reflect the changes to the landscape as a result of the spruce mortality and the treatments being proposed, using the updated SMS inventories to define the boundaries. The boundary changes utilize the most recent analysis and SMS inventory to better reflect the management emphasis for scenic and recreation resources as intended in the Forest Plan. The 2B Management areas were defined in part by the foreground views from primary travelways and highways that were often driven for their scenic quality (personal communication with Max Molyneux, Dixie National Forest Landscape Architect). The foreground views are currently defined by dense tree stands, made up primarily of mature spruce. This was taken into account when defining the original boundaries. Given the anticipated effects of the spruce beetle, much of the spruce will be dead or harvested, and the views will be constrained by topography rather than forest cover in many areas. The boundaries have been adjusted to reflect longer foreground views to the topographic limits in the 2B Management Area in the South SERP analysis area.

Also included in this amendment are adjustments to the 2A Management Area in the Andesite and Red Desert Focus Areas. The 2A areas were altered to better to incorporate the contiguous areas of undeveloped character that provide semi primitive recreation opportunities. This adjustment is the result of the analysis of undeveloped areas included as part of this project. Tables C and D provide a summary of the changes resulting from the proposed amendment to the Forest Plan.

Table C: Acreage Changes in Proposed Management Area Changes

Focus Area	Management Area									
	1		1 A		2A		2B		7A	
	Current	Proposed	Current	Proposed	Current	Proposed	Current	Proposed	Current	Proposed
Andesite	1667	347	-	-	8022	8992	6	450	161	65
Deer Valley	10	10	120	18	-	-	1069	1993	3357	2535
Long Valley	656	97	-	-	71	386	1578	2492	2782	2112
Radar Ridge	1390	869	-	-	-	-	453	974	-	-
Red Desert	433	44	-	-	416	805	-	-	-	-

Table D: The Proposed Scenic Integrity Objectives for this Project Area

Management Area	Current Visual Quality Objective in the DNFLRMP	Proposed Scenic Integrity Objective and Desired Landscape Character for the South SERP area
1-General Forest Direction	Meet the visual quality objectives of retention and partial retention one full growing season after completion of a project. Meet modification and maximum modification objectives three full growing seasons after completion of a project.	The desired landscape character will be mapped for all general direction areas. The scenic integrity objectives will be determined based on proximity to concern level 1 & 2 roads and areas ¹ , and the SMS system inventory and analysis ² .
2A-Semi Primitive Recreation	Do not go below an adopted Visual Quality Objective of partial retention.	The desired landscape character is natural appearing. The scenic integrity objective is high. When management activities or natural changes reduce the existing scenic integrity to less than high, a transition strategy should be determined and implemented to return the landscape to high scenic integrity.
2B-Rural & Roaded Recreation Opportunities	Do not go below an adopted Visual Quality Objective of partial retention.	The desired landscape character is natural appearing. The scenic integrity objective is high. When management activities or natural changes reduce the existing scenic integrity to less than high, a transition strategy should be determined and implemented to return the landscape to high scenic integrity.
7A-Wood Production and Utilization	Do not go below an adopted Visual Quality Objective of: Partial retention within the foreground of arterial/collector roads and primary trails. Modification on all other areas.	The desired landscape character is natural appearing. The scenic integrity objective in the foreground of concern level 1 and 2 roads ¹ is moderate. The SIO is low for all other areas. When management activities or natural changes reduce the existing scenic integrity to below the specified SIO, a transition strategy should be determined and implemented to return the landscape to the specified SIO.

¹A map with the concern levels is included in appendix 12 of the FEIS.

²A map with the Scenic Integrity Objectives is included in appendix 13 of the FEIS. The inventory and associated maps are included in exhibit 19 in the project file.

Identification of the Preferred Alternative

The preferred alternative is Alternative A with the following modifications:

- Add sites 1230056 (48 acres), 1260002 (14 acres), 1260007 (71 acres), and 1260011 (21 acres) for salvage/improvement treatments as shown and analyzed under Alternative B. None of these sites are within any inventoried roadless area but are located within areas designated as category two of the interim rule. Site 1230056 is located in the Long Valley Focus Area with the remaining sites located in the Radar Ridge Focus Area. The effects of treating these sites are disclosed in Chapter Four under Alternative B. These areas would be harvested only when they become infested at epidemic levels as previously described.
- Drop sites 1250003 (38 acres), 1250014 (12 acres), 1250081 (21 acres) and 1250091 (13 acres) to maintain wildlife habitat.

- Reduce the miles of road closed from approximately 42.4 to 40.9. The roads that will remain open compared to the other action alternatives are located in the Long Valley Focus Area and will result in an open road density of 1.84 miles per square mile compared with 1.82 with the other action alternatives. This change in road closures reflects the public comments received during the comment period.
- To be consistent with the March 1, 1999 interim road rule, drop the temporary road construction proposed under Alternative A.
- To be consistent with the 1999 appropriations act, drop the 377 acres of aspen regeneration with fire only (sites 1140042, 44, 46, and 49, 1230016, 18, 20, 31, and 33). The appropriations act specifies that prescribed burns on lands classified in Forest Plans as timber base will not consume commercial wood products that could be removed in a commercially viable manner without public comment.

With these changes, the modified Alternative A will:

1. Salvage harvest dead, dying, and susceptible green Engelmann spruce, and selected green subalpine fir trees using improvement treatments (2,602 acres). Harvest green spruce and subalpine fir over existing aspen clones to liberate or stimulate aspen regeneration (289 acres). These activities will be conducted with ground-based and aerial yarding systems. Exclusive of the aspen liberation/regeneration treatment (289 acres), these activities will not occur unless the areas become infested with epidemic or outbreak levels of spruce beetle. Presently, an estimated 153 acres are infested at epidemic levels.

For the purpose of clarification, susceptible green Engelmann spruce are those trees greater than eight inches in diameter at breast height (4.5 ft. from ground level) located in a site with epidemic levels of spruce beetle populations.

A tree is considered infested when it exhibits reddish-brown boring dust accumulating at the beetle's entrance holes, in bark crevices, and on the ground around the trunk of infested trees. Masses of pitch may accumulate around the entrance sites. Needle discoloration is also an indication of a previously infested host. Needles will turn a yellow-green color before dropping to the forest floor.

The infestation is considered at epidemic levels when, over a 10 acre site, there are 2-3 infested tree clusters per acre. Each cluster will have 5-7 infested trees. When this condition occurs in each site identified for treatment on figure 5, harvest activities will be implemented.

2. Regenerate approximately 86 acres of mature to old aspen stands with fuelwood or sawtimber harvesting followed by prescribed burning (see figure 5), and

3. Reduce open road densities with temporary and permanent closures of existing, open roads. Road closures are proposed on 40.9 miles of roads and would reduce the open road density to the Forest Plan guideline of two miles per square mile or less. Measures will also be implemented to improve previous road closures that are currently ineffective.

No specified road construction or timber harvesting (including aspen) will occur within the roadless areas shown in appendix 7 of the FEIS. Approximately 51.0 miles of existing roads will require prehaul maintenance, and 0.1 miles of specified road will be constructed. Reforestation activities will occur on approximately 1,600 acres. As stated on page 2-9 of the FEIS, hauling could occur through Cedar Breaks National Monument on Highway 148 north to the junction of Highway 143 (see figure 5) if no other access routes through private land are feasible.

Follow-up treatments including fuels reduction and tree planting would continue for 1-5 years following the initial treatment in the timber harvest areas. Fuels reduction work is scheduled to reduce wildfire risk, minimize impacts in visually sensitive areas, and prepare the sites for natural or artificial reforestation. Reforestation activities are scheduled for approximately 1,600 acres in areas not expected to meet full stocking levels.

Application of the insecticide carbaryl to approximately 1,000 trees in a 10 acre area along Highway 148 is also included in the selected alternative. This bark beetle control measure is widely used to protect trees from bark beetle infestation and would be implemented to maintain scenic value objectives along the highway into Cedar Breaks National Monument.

A site specific Forest Plan Amendment is also approved under the selected alternative for the purpose of adopting the Scenery Management System and adjusting the boundaries of management areas 1A, 2A, and 2B within the South SERP (Spruce Ecosystem Rehabilitation Project) area.

Affected Environment

The FEIS describes the baseline environment for the area that would be affected or created by the alternatives considered. The affected environment includes major issue, resources important to the analysis area, and resources that must be addressed due to Federal law or regulation. The issues and resources are listed below in the order they appear in the FEIS.

- Vegetation
- Recreation
- Scenic
- Soils
- Hydrology
- Fisheries
- Wildlife
- Range
- Heritage
- Social/Economic
- Air Quality
- Special Uses
- Fire/Fuels
- Transportation

Environmental Consequences

The major effects of the Action Alternatives on the issues and resources are summarized for comparison on Table 2-4, page 2-16 of the FEIS. This table is intended to provide a quick comparison of the effects of the alternatives on the major issues in the FEIS. For a more detailed narrative description of the alternative effects on major issues and other resources, see Chapter Four of the FEIS.

CORRECTIONS/ADDITIONS FOR THE SOUTH SPRUCE ECOSYSTEM REHABILITATION PROJECT FEIS

INTRODUCTION

Following the completion of the public review/comment period of the Draft Environmental Impact Statement for the South Spruce Ecosystem Rehabilitation Project (South SERP) and the review of the appeals and additional comments received on the December 18, 1998 Record of Decision, the Forest Supervisor has determined that the corrections and additions needed to the South SERP FEIS were not extensive enough to warrant printing a new document. These corrections and additions to the FEIS, therefore, are included in this attached package. Documents 1 through 4 were included in the package associated with the December 18, 1998 Record of Decision. Document 4, however, has been edited to reflect the additional comments received. Document 5 is a new document associated with this decision.

The following documents with instructions are contained in this package:

1. Cover pages (2) for the FEIS. Please remove the first two pages of the DEIS and replace them with the two enclosed.
2. Heritage Resources Chapter Four effects assessment. This page replaces the assessment on page 4-77 of the DEIS which was inadvertently carried forward from the SERP FEIS.
3. Roadless characteristics effects assessment. This document is divided into Chapter Three and Chapter Four sections and supplements the Recreation Resource assessment. They should be inserted following page 3-14 and 4-27 respectively. The effects of the proposed activities on roadless characteristics are generally disclosed in the FEIS but this document summarizes the effects using baseline criteria found in FSH 1909.12, Chapter 7.
4. Chapter Eight of the FEIS - Response to Comments. Insert this chapter following Chapter Seven of the FEIS. This chapter summarizes the response to comments received during the comment period of the DEIS and during the additional comment period as directed by the Regional Forester following a review of the appeals received on the December 18, 1998 Record of Decision.
5. Clarification of Alternatives A and B - This document replaces the descriptions of Alternatives A and B found on pages 2-14 of the DEIS and page 10 of FEIS Summary. The activities proposed in these alternatives do not change but this document adds further detail to the activities proposed under Alternatives A and B by using the same format as the Proposed Action (pages 2-9 to 2-12).

Add the following literature citations to Chapter Six:

Chronic, Halka. 1990. Roadside Geology of Utah. Mountain Press Publishing Company. Missoula, MT (exhibit 27, document 5).

Power, T.M. 1996. Environmental Protection and Economic Well-Being: The Economic Pursuit of Quality. M.E. Sharpe; Armonk, NY, pp 250 (exhibit 27, document 6).

Rodriguez et.al. 1998. Conservation Strategy and Agreement for the Management of Northern Goshawk Habitat in Utah (exhibit 27, document 7).

State of Utah, Division of Wildlife Resources, pub 97-17. 1997. Utah Big Game 1997 Annual Report (exhibit 27, document 8).

State of Utah, Division of Wildlife Resources, pub. 97-1. 1997. Utah Upland Game Annual Report 1996 (exhibit 27, document 9).

McDonald, P.M. and K. Grandison. 1995. Small Mammal Monitoring in the Brian Head/Cedar Breaks Area, Dixie National Forest, Utah - 1995 (exhibit 27, document 10).

McDonald, P.M. et. al. 1996. Ecological Monitoring of the Brian Head/Cedar Breaks Area, Dixie National Forest, Utah - 1996 (exhibit 27, document 11).

Summers, P. et. al. 1998. Ecological Monitoring of the Brian Head/Cedar Breaks Area, Dixie National Forest, Utah. 1998 (exhibit 27, document 12).

Graham, R.T. et. al. 1999. The Northern Goshawk in Utah: Habitat Assessment and Management Recommendations. USDA Forest Service, Rocky Mountain Research Station, RMRS-GTR-22. 48 p. (exhibit 27, document 13).

Hastings, F.L., R.A. Werner, P.J. Shea, E.H. Holsten. 1998. Persistence of carbaryl within boreal, temperate and Mediterranean ecosystems. Journal of economic entomology; Vol. 91, no. 3 (1998): p. 665-670. Supported by a USDA NAPIAP grant, cooperative number PNW 93-0337 (exhibit 27, document 14).